

MODULARIO
I.C.A. - 101

MINISTERO DELL'INDUSTRIA, DEL COMMERCIO E DELL'ARTIGIANATO

DIREZIONE GENERALE DELLA PRODUZIONE INDUSTRIALE
UFFICIO ITALIANO BREVETTI E MARCHI

REC'D 19 JUL 2000

WIPO PCT



EP 00/05332

INV. IND.

Autenticazione di copia di documenti relativi alla domanda di brevetto per

N. PN99 A 000063

E J W

*Si dichiara che l'unita copia è conforme ai documenti originali
depositati con la domanda di brevetto sopraspecificata, i cui dati
risultano dall'accluso processo verbale di deposito*

PRIORITY DOCUMENT

SUBMITTED OR TRANSMITTED IN
COMPLIANCE WITH
RULE 17.1(a) OR (b)

04 MAG. 2000

Roma, li

IL DIRETTORE DELLA DIVISIONE

Ing. ROMANI

5

10 ENTERING INJECTION MOULDED PREFORMS IN A MOULD OF A HIGH-EFFICIENCY BLOW-MOULDI
NG APPARATUS

DESCRIPTION

15 The present invention refers to an improved apparatus and a related process for blow moulding preforms of thermoplastic material, in particular such an apparatus as generally described in the Italian patent application no. PN98A000042 filed by this same Applicant.

20 The peculiarities of the apparatus described in the above-cited patent application lie in the fact that it is provided with:

25 - a plurality of pairs of mutually joinable half-moulds, which are associated to an appropriate, preferably revolving structure for handling said half-moulds, and preform support devices corresponding to said half-moulds,

- a preform feeding mechanism to deliver an orderly sequence of preforms held at an appropriate blow-moulding temperature into the respective pairs of half-moulds kept in their opened position and associated to said rotary member,

30 - a pick-up device adapted to recover the finished container from the respective pair of half-moulds upon the opening thereof,

- an opening and clamping mechanism adapted to clamp the half-moulds together after they have moved through the position of the preform feeding

mechanism, and to open them before they move through the position of the pick-up mechanism for removing the finished container, in which said pairs of half-moulds are constituted by a stationary half-mould and a moving half-mould capable of being opened from and clamped against said stationary half-mould.

5

In particular, said stationary half-moulds are substantially joined to said structure, which is preferably rotating about a vertical axis, and are arranged in a substantially vertical position, with the moving half-moulds adapted to be clamped against the respective stationary half-moulds with a substantially rotary movement
10 having a horizontal axis of rotation.

The other general, construction and use characteristics of the apparatus according to the present invention are thoroughly described in the afore cited Italian patent application no. PN98A000042, to which reference should therefore be
15 made.

Anyway, to the purpose of favouring a better and readier understanding by a reader, the origin of and the technical-industrial ground on which said patent is based are briefly recalled here. In practice, it has been originated by the fact that,
20 according to prior-art techniques, the blowing moulds in an in-line arrangement turn out to be particularly critical, since with increasing blow-moulding pressures, as well as with increasing numbers of cavities contained in each single pair of blow-moulding plates, increasingly rapid and powerful pumping stations are required. Furthermore, the increased overall pressure generated by the bottles during blow
25 moulding must be contrasted by a correspondingly greater mould clamping pressure.

However, such a pressure, which is not only considerably higher, but also pulsating, has a negative effect also on the actual resistance of the same moulds,
30 which are not only caused to undergo a greater pressure, but are at the same time required to withstand such a greater pressure on a longer arm, considering the greater number of blowing gates, and this of course makes their rigidity more critical and their tendency to deform outwardly much more likely, with easily

imaginable effects on the quality of the blow-moulding process and the blow-moulded bottles themselves.

Furthermore, when blowing moulds provided with a great number of cavities
5 are used, the time required to transfer all preforms into the respective cavities increases proportionally, and this of course causes the whole cycle time to INCREASE under a clear reduction in the productivity of the moulding apparatus.

Just in view of doing away with these drawbacks, the practice is known from the
10 disclosures in the publications US 3,596,315 - US 4,233,022 - EP 0 596 487 - US 4,850,850 and US 4,313,720 of using to preform blow moulding purposes apparatuses that are adapted to rotate about a vertical axis in a carousel-like manner, in which the outer sides are occupied by a plurality of blowing half-moulds capable of opening from and clamping against each other in an orderly and
15 sequential manner. However, in these apparatuses it is actually both half-moulds that are driven to move. They furthermore move in a so-called "book-like" manner, in that each one of them moves about a respective vertical axis.

Apparatuses of this kind are connected with generally known drawbacks and
20 construction complications, since both half-moulds must be handled to move synchronically. Furthermore, the fact that they open in a horizontal direction, and therefore by widening apart, makes it necessary for the entire carousel-like arrangement to be sized correspondingly; it in particular requires apparatuses to be used which are significantly larger and, therefore, more awkward to be handled
25 and installed.

In view of doing away with the problems connected with the use of moving half-moulds rotating about respective vertical axes, an apparatus of the kind described in the afore mentioned Italian patent application has been disclosed.

30

Nevertheless, even this kind of apparatus has still some problem left with it and offers margins for further improvement, which may be summarized as follows:

- the need for the neck of the preform to be locked in place, ie. clamped with a mould (the half-moulds) makes it necessary for the same preform to be released from its transferring means only upon the half-moulds being completely clamped together; this of course requires that the related operations be carried out in series, 5 ie. in a sequence, under resulting greater usage of time, which of course contributes to an increased overall cycle time and, therefore, a marked reduction in the performance capabilities and the general productivity of the entire apparatus;

- furthermore, upon the final container having been blow-moulded, the opening 10 of the mould quite frequently gives rise to a slight displacement of the respective container and this makes much more difficult for an appropriately provided pick-up and unloading member to engage the neck portion of the container and then transfer the same container into the next station.

15 Based on the above considerations, it is therefore a main purpose of the present invention to provide the blow moulding apparatus for the production of hollow bodies, as well as the operating mode thereof, in such a manner as to enable its productivity to be increased by the effect of an accelerated movement of the blowing half-moulds.

20

A further purpose of the present invention is to make it possible for the blow-moulded container to be firmly and reliably held in position when the respective half-moulds are opened.

25 The apparatus and the method according to the present invention shall furthermore be capable of being implemented with the use of currently available techniques and, therefore, shall be reasonably low-cost, reliable and preferably capable of being integrated with a preform production stage situated upstream.

30 These aims, along with other features of the present invention, are reached in a blow moulding apparatus that is made and operates as recited in the appended claims, and may be implemented in some parts, or arrangements thereof, a preferred embodiment of which is described below in detail and illustrated with

reference to the accompanying drawings, in which:

- Figures 1 through to 5 are respective perspective views of a portion of apparatus according to the invention, as illustrated to represent five subsequent
5 operating phases;

- Figures 1a, 1b are top views of the portion of apparatus of Figure 1 and the median cross-section thereof taken along the section A - A of Figure 1a, respectively;

10

- Figures 2a and 2b are views similar to those of Figures 1a, 1b above, but referred to Figure 2; the same applies also to Figures 3a and 3b, 4a and 4b, and 5a and 5b with reference to the perspective views in Figures 3, 4 and 5;

15 - Figure 6 is a different perspective, partly see-through view of the same assembly of Figure 4;

- Figure 7 is a simplified view along the section B - B of Figure 6;

20 - Figure 8 is a perspective view of a component part of an apparatus according to the present invention;

- Figures 9 and 10 are a bottom and a front view, respectively, of the component part of Figure 8.

25

The basic peculiarity of the present invention lies in the use, in an apparatus of the described type, of devices and methods that are capable of locating and clamp a preform in a suitable position in view of the subsequent blow moulding step, regardless of the actual position of the respective pair of blow-moulding half-
30 moulds.

This result is obtained, in a pair of blow-moulding half-moulds 1 and 2, by means of following devices:

- a fork means 3 which is firmly joined to a first one 1 of said blow-moulding half-moulds 1 and 2,

5 - a small-tube assembly 4 adapted to be at least partially inserted in the mouth opening 6 of the preform 7 when the latter is associated to said fork means 3,

- a pincer-like gripper 5 adapted to transport said preform so as to enable it to engage the respective fork means 3.

10

If Figures 1 through to 5 are in particular observed, along with the respective top and cross-sectional views, at least following five phases can be identified, in which said component parts are caused to operate in a coordinated manner so as to achieve the desired result.

15

Said five phases, each one of which is represented by the illustrations in the subsequent Figures 1, 2, 3, 4 and 5 for reasons of greater simplicity, may be described as follows:

20 Phase a) Figure 1. The half-moulds 1 and 2 are at least partially open; the gripper 5, to which the preform 7 is coupled, is gradually approached to the fork means 3, and namely to a receptacle 8 provided facing the second half-mould 2; in this phase, the small-tube assembly 4 is in a position in which it is raised from its working position, which will be explained in greater
25 detail further on;

Phase b) Figure 2. The gripper 5 transports the preform 7 up to into said receptacle 8 of the fork means 3. In particular, it is the cylindrical portion underneath the neck ring 14 of the preform that fits into said receptacle 8, so that the preform itself is positively prevented from sliding downwards and also
30 from displacing laterally with respect to the half-mould 1.

All other illustrated component parts remain in their initial position, with the exception of the second half-mould 2 which can start, or continue, its

clamping stroke.

Phase c). Figure 3. The small-tube assembly 4 is lowered until it is inserted in the mouth opening 6 of the preform.

5 This small-tube assembly is formed by an insert 10, in the interior of which there is slidably arranged a traditional stretching rod 11; this insert has a substantially cylindrical shape and is provided with a plurality of external ribs 13 which are in such a size and geometry as to be able to get exactly inserted into the inner cylindrical wall of the mouth portion of the preform, so that, when said insert is lowered with the small-tube
10 assembly 4, it becomes disposed on to the preform in a firmly joined manner therewith.

Furthermore, between said outer ribs 13 there are provided corresponding passages 14 adapted to enable gas to flow from the
15 outside of the preform into the interior of the latter (see Figures 8, 9 and 10); the purpose of these passages is to enable the gas needed to blow mould the preforms to flow in when the small-tube assembly 4 is lowered and, therefore, when the respective insert is firmly fitted into the mouth portion of the respective preform.

20

Phase d) Figure 4. The gripper 5 is separated from the respective preform and is moved into an appropriate position in view of a subsequent preform loading phase.

The possibility for the gripper 5 to be separated by simply pulling it away
25 is ensured in a particularly easy and safe manner, without any risk of damaging the preform, if a gripper is used of the type described in the Italian utility model application no. PN99U000023 filed by this same Applicant.

It should be noticed that it is in this phase d) that the condition is practically
30 created which brings about most of the advantage offered by the present invention: in fact, the stability of the position of the preform is determined by the combined action of the insert 10, which prevents the preform from moving or displacing tangentially, and the fork means 3 which, by

engaging the preform underneath the neck ring 14 thereof, prevents it from sliding downwards.

5 In this condition, the preform itself is completely associated in a firm manner to a half-mould, in a position in which it is adapted to be blow moulded, regardless of the position of the other counter-mould, which can in this way continue with its clamping stroke.

10 Phase e) Figure 5. The two half-moulds are completely clamped against each other; in particular, the moving half-mould 2 brings its previously started stroke to completion, so as to close in on the half-mould 1.

15 It can therefore be readily recognized that a saving can be obtained on the overall cycle time if the fact is duly considered that final positioning of the preform in view of blow moulding takes actually place well in advance of the half-moulds being closed and clamped together, so that the preform handling gripper is able to start releasing the preform and moving away beforehand and the time required for the moulds to be clamped in order to have the preform duly locked in position can actually be saved (since the preform itself is already locked in position by the above cited means).

20

From this phase on, the process goes on according to the traditional technique until the actual blow-moulding phase is eventually completed, at the end of which the half-moulds are then separated and the blow-moulded container is removed by a respective gripper in a sequence of operations that is fully similar to, albeit in the reverse order, the sequence followed for loading the preform in the mould.

25

The reader should furthermore duly notice that the use of the small-tube assembly 4, comprising its insert piece and stretching rod, is not to be considered as being inherently part of the present invention, since similar devices are already known and used in the technical practice. An integral part of this invention is on the contrary the particular type of totally new and original use that is made of such a small-tube assembly.

30

In fact, this small-tube assembly is used not only to perform traditionally as a stretching rod and channel for the blow-moulding gas to flow therethrough, but also as an innovative means for centering the preform and locking it in position by acting in combination with the afore mentioned fork means, in such a manner as to lock the preform in the desired position without using the half-moulds and regardless of the position of the same half-moulds.

In practice it can be concluded that, with the method according to the present invention, ie. owing to the clamping phase of the moving half-mould occurring almost at the same time as the preform insertion phase, as well as the opening phase of the same moving half-mould occurring almost at the same time as the moulded-container removal or ejection phase, thanks to the particular conformation, arrangement and use of the afore described devices, a reduction in total blow-moulding cycle time can actually be obtained.

15

The described apparatus and method can be most effectively used if a plurality of pairs of half-moulds are applied all along the outer periphery of a generally per se known central rotary structure 20, in which:

20 - in each one of said pairs, one of said half-moulds 1 is stationary and joined to said rotary structure and is preferably arranged on a vertical plane with the respective half-cavity 1A facing outwards and oriented radially with respect to said rotary structure;

25 - the other half-mould 2 is movable with a rotary motion about an axis arranged on the horizontal plane as hinged on a rotation device (not shown) in such a manner that, when it is raised into its clamped position, it is able to move into exact coupling with said stationary half-mould joined to said rotary structure. In this way the need will only arise for the sole opening and closing movement of the moving half-mould 30 2 to be actuated, since the other half-mould 1 is stationary and substantially joined to the rotary structure 20.

Therefore, if the various phases into which the cycle time can be broken down,

ie. (to name just the more important ones):

- preform insertion (at a fixed station),
- lowering of the small-tube assembly,
- 5 - mould clamping,
- blow moulding,
- mould opening,
- raising of the small-tube assembly,
- removal and unloading of the finished container at a fixed station,

10

are so adjusted and arranged as to be able to be carried out during exactly a complete rotation of the rotary structure, a particularly efficient and simple apparatus will be obtained which is capable of ensuring a really considerable productivity-to-size (ie. space requirements) ratio as compared with rotary

15 apparatuses of a traditional type.

5

CLAIMS

10

1. Apparatus for blow moulding hollow plastic containers, comprising:

- a plurality of pairs of openable and closable half-moulds capable of being coupled to each other and clamped together, said pairs being associated to an appropriate central structure (20),

15 - devices to handle, transfer and introduce the preforms in said corresponding half-moulds as these are kept in their open position,

- a pick-up device adapted to remove the blow-moulded container from the pair of half-moulds upon them being opened, ie. separated,

- a mould opening and closing mechanism adapted to close, ie. clamp said half-
20 moulds together upon them having passed through the position in which preform insertion is carried out, and to open, ie. separate said half-moulds from each other in correspondence of the mechanism provided to remove the finished container therefrom,

characterized in that

25 - there are provided means adapted to arrange a respective preform in a pre-defined position suitable for blow moulding, and to hold it in this position regardless of the position and mutual relation of said respective pair of half-moulds, in particular when said half-moulds are at least partially open, ie. separated from each other.

30

2. Apparatus according to claim 1, characterized in that said means comprise:

- a fork member (3) joined to a respective stationary half-mould (1) and provided with a receptacle (8) adapted to place the respective preform into said

respective pre-defined position,

- a pincer-like gripper (5) adapted to transfer a respective preform (7) from an external position and automatically fit it into said receptacle (8) of the respective fork member (3), as well as to automatically disengage from said preform upon the
- 5 latter having been firmly fitted into said respective receptacle,

- a small-tube assembly (4) adapted to move into inserting in the mouth portion (6) of said preform when the latter is so restrained in said respective receptacle (8).

3. Apparatus according to claim 2, characterized in that the locked condition of

10 said preform is determined:

- either by it engaging said pincer-like gripper (5),
- or by the combined action of said fork member (3) and the respective small-tube assembly (4).

15 4. Apparatus according to claim 3, characterized in that said small-tube assembly comprises:

- a substantially cylindrical insert piece (10) adapted to firmly fit into the mouth portion of the respective preform,
 - a stretching rod (11), which is provided slidably inside of said insert piece and
- 20 is adapted to be displaced in a rectilinear manner into the respective preform when said respective insert piece is so firmly fitted into the mouth portion of said respective preform.

5. Apparatus according to claim 4, characterized in that said insert piece (10) is

25 provided along its periphery with a plurality of passages or recesses (14) adapted to enable gas to flow from the outside to the inside of the respective preform when said insert piece is fully and firmly fitted and locked into the respective preform.

6. Apparatus according to any of the preceding claims, characterized in that

30 said central structure (20), to which said pairs of half-moulds are associated, is a rotary structure on a horizontal plane, and said pairs of half-moulds are arranged, preferably regularly spaced from each other, along a circular periphery centered on the axis of rotation of said rotary structure.

7. Apparatus according to claim 6, characterized in that said pairs of half-moulds are comprised of a respective stationary half-mould (1) and a respective moving half-mould (2) capable of opening from and closing against the respective stationary half-mould.

8. Apparatus according to claim 7, characterized in that said stationary half-moulds are substantially joined to said appropriate central structure (20) and are arranged in a substantially vertical position, and the respective moving half-moulds (2) are adapted to move into clamping with a substantially rotary movement about respective horizontal axes of rotation.

9. Apparatus according to claim 8, characterized in that said horizontal axes are orthogonal to the axis of rotation of said rotary central structure.

15

10. Method for inserting and locking a preform in a pre-determined position of a pair of blow-moulding half-moulds, characterized in that it comprises following five phases, in which:

a) - said preform is approached to said pre-determined position by means of a respective gripper (5) adapted to engage said preform, said gripper being capable to be transferred in a controllable manner into an appropriate disposition with respect to a pre-defined one (1) of said half-moulds:

b) - said preform is locked in place with respect to an appropriate receptacle member (8) that is firmly joined to said pre-defined one (1) of said half-moulds;

25 c) - an appropriate small-tube assembly, which is comprised of an insert piece (10) and a respective stretching rod (11), is inserted in the mouth portion (6) of said preform;

d) - said gripper (5) automatically disengages from the respective preform;

e) - said pair of half-moulds moves into closing and clamping.

30

11. Method according to claim 10, characterized in that the above cited phases d) and e) are adapted to be performed at least partially at the same time.

12. Method according to claim 10 or 11, characterized in that the above cited phases c) and e) are adapted to be performed at least partially at the same time.

13. Method according to any of the claims 10 to 13, characterized in that said
5 rotary central structure is adapted to support a plurality of pairs of said half-moulds according to claims 1 to 9, and that said five phases a) to e) are performed in an automatic, continuous and orderly sequence for said plurality of pairs of said half-moulds.

10 14. Method according to claim 13, characterized in that the rotation period of said rotary central structure coincides with the cycle time corresponding to the steps during which

- the preform is loaded in the mould,
- the mould is closed and clamped,
- 15 - the preform is blow moulded through the various steps connected with the process,
- the mould is opened by the separation of the respective half-moulds,
- the blow-moulded product is removed therefrom.

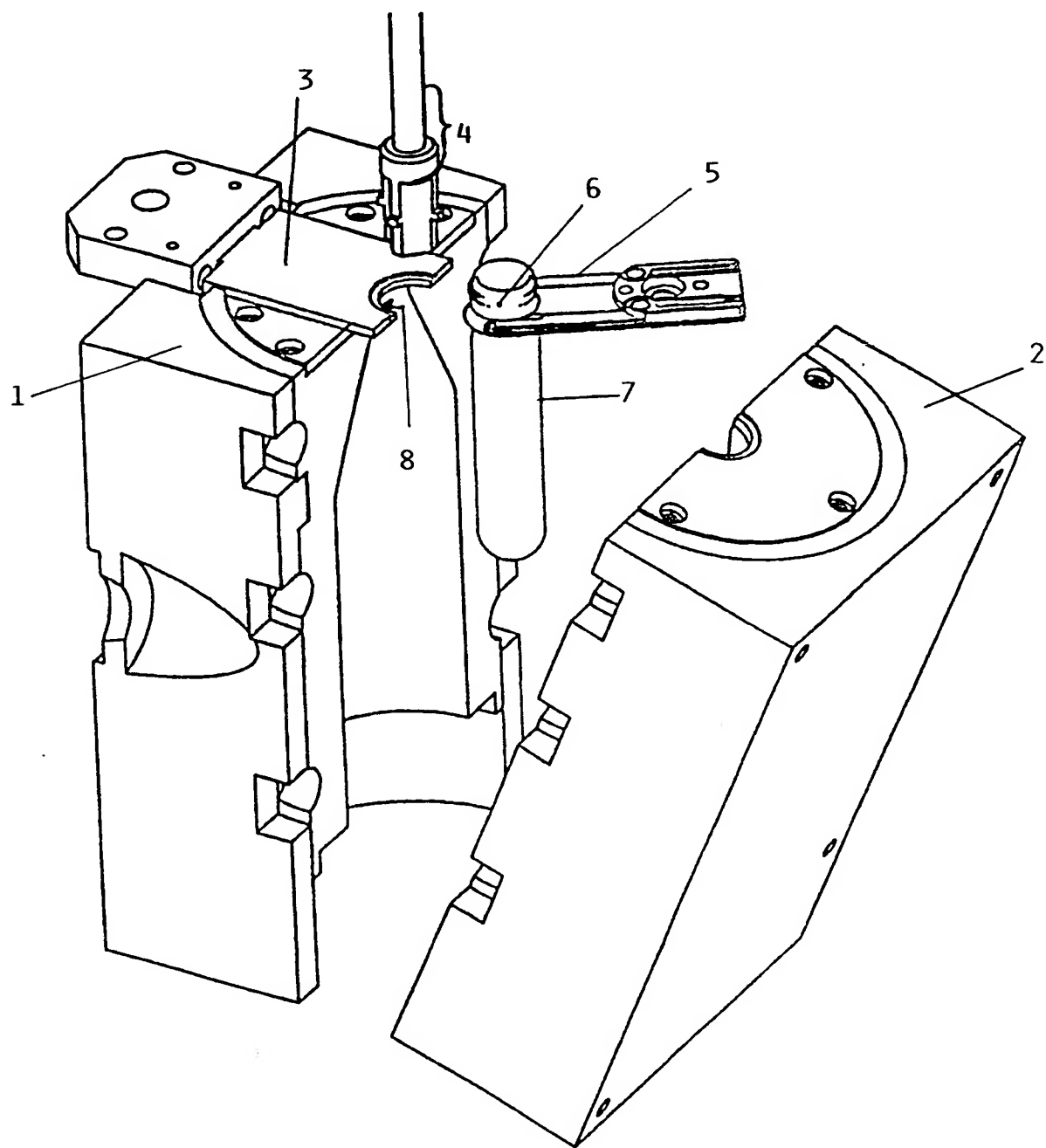
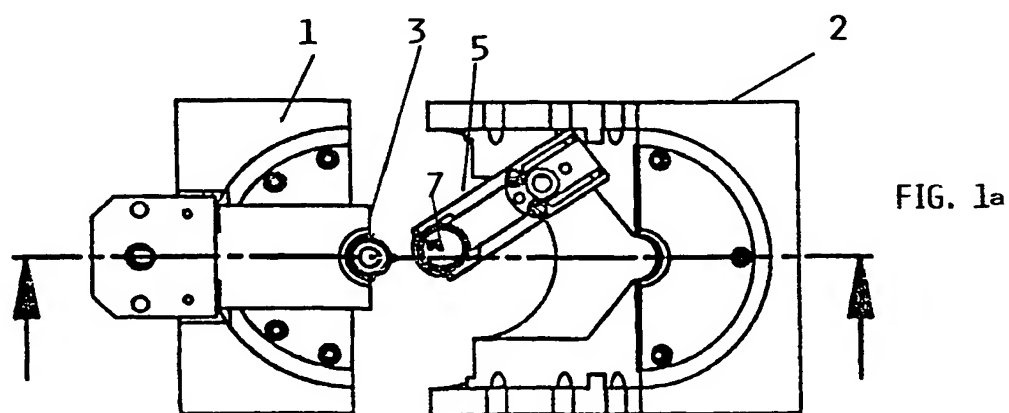
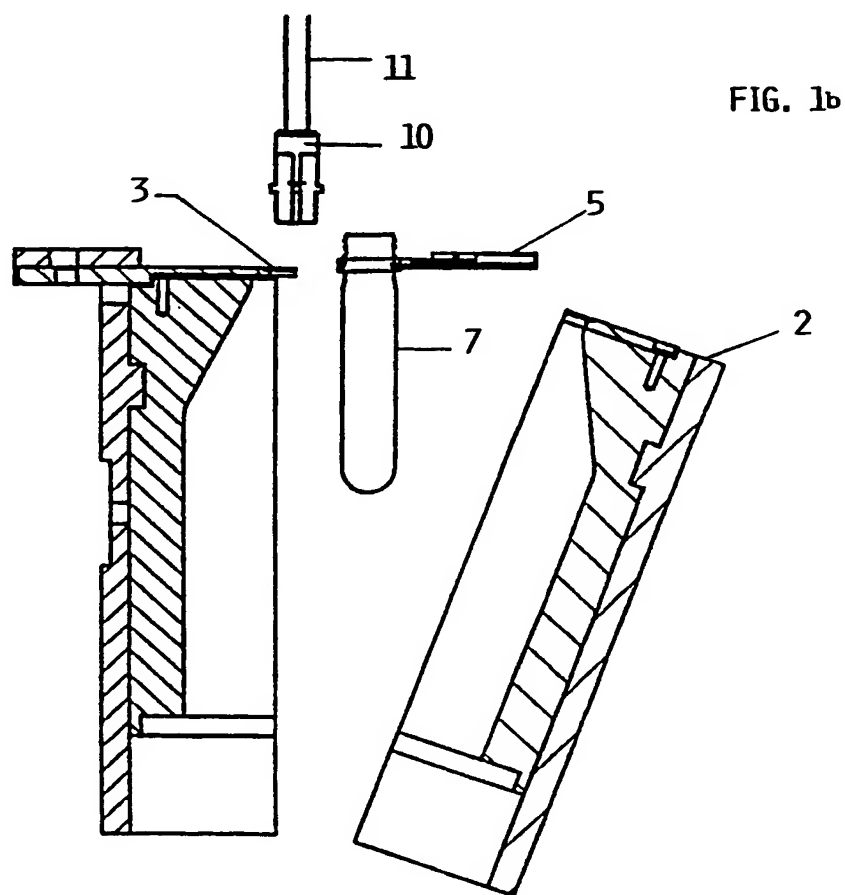


FIG. 1



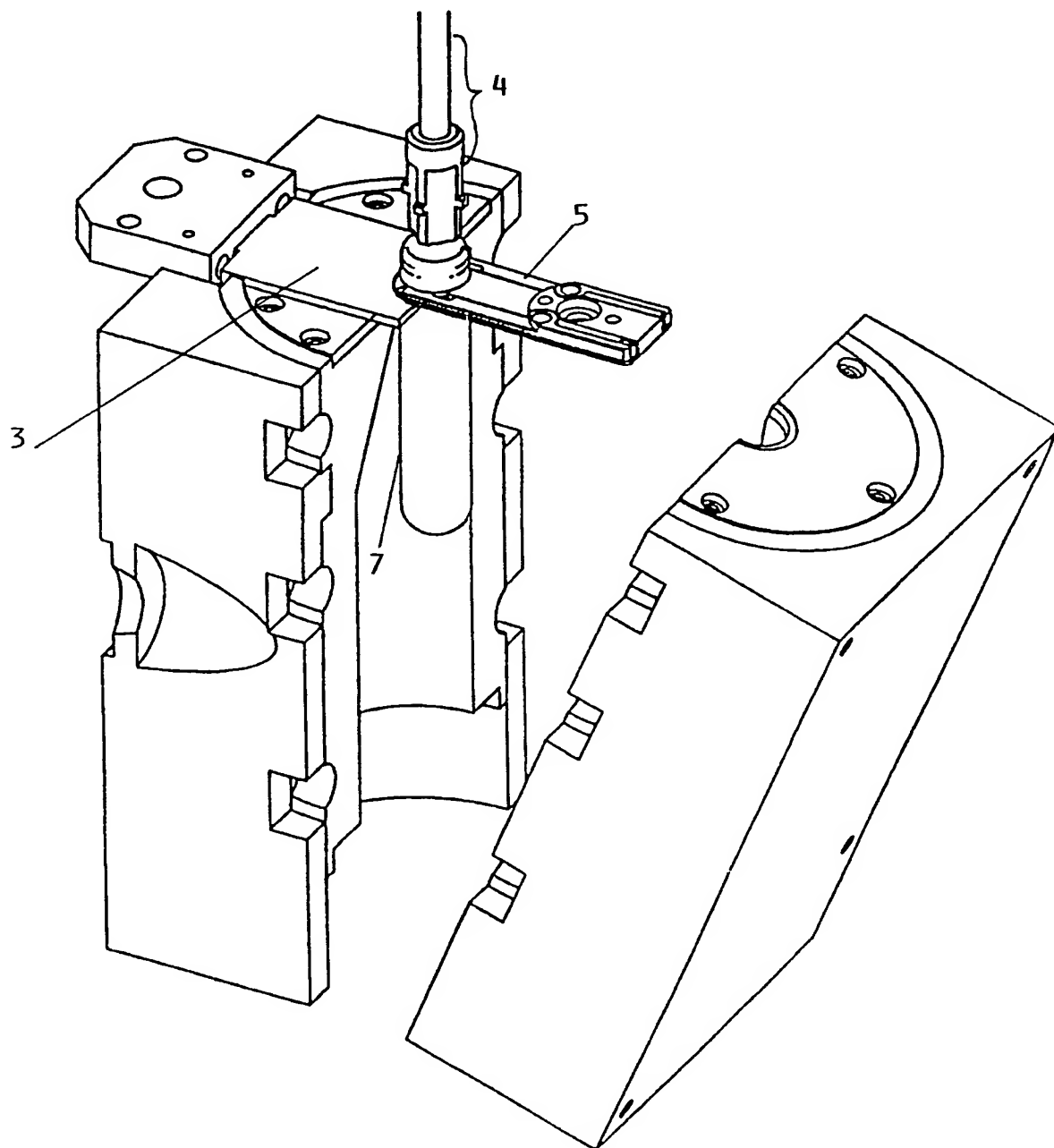


FIG. 2

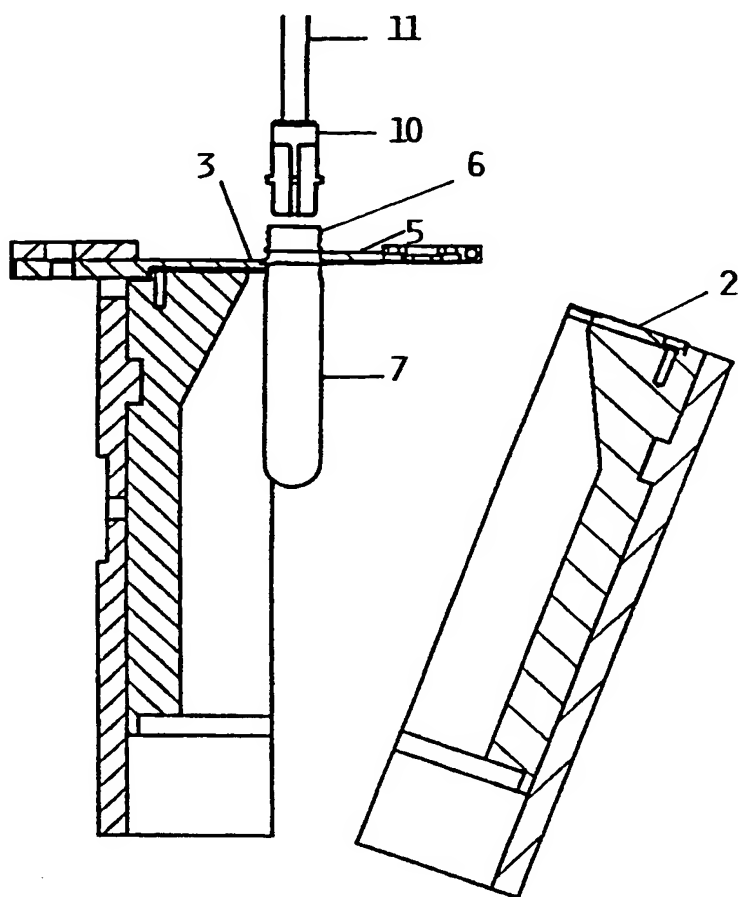


FIG. 2b

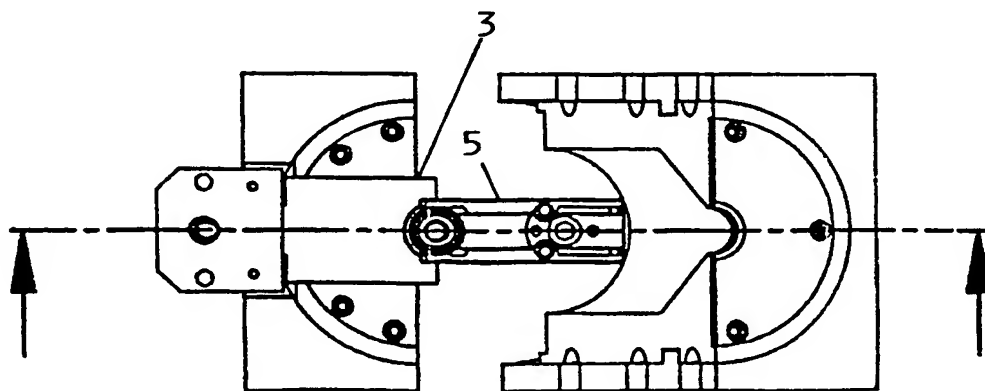
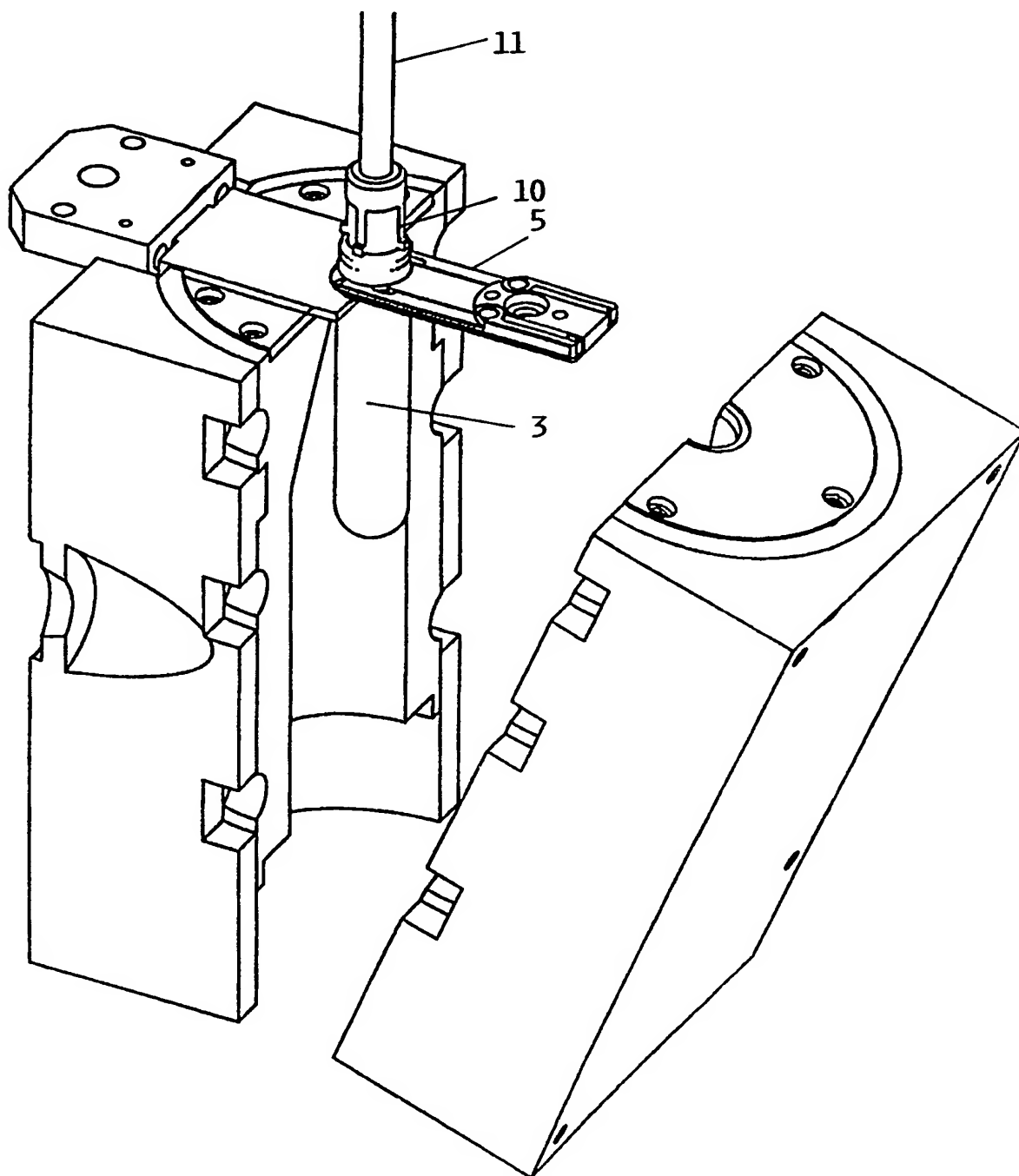


FIG. 2a



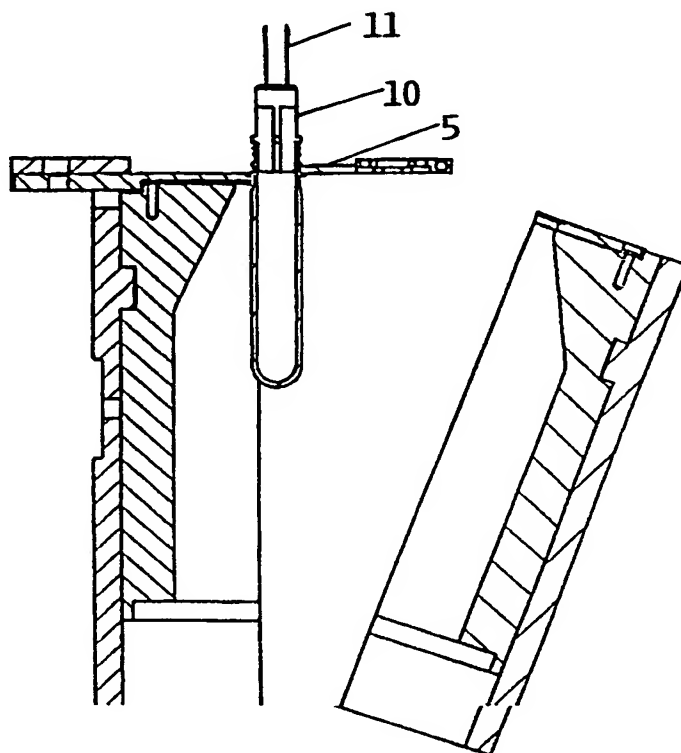


FIG. 3 b

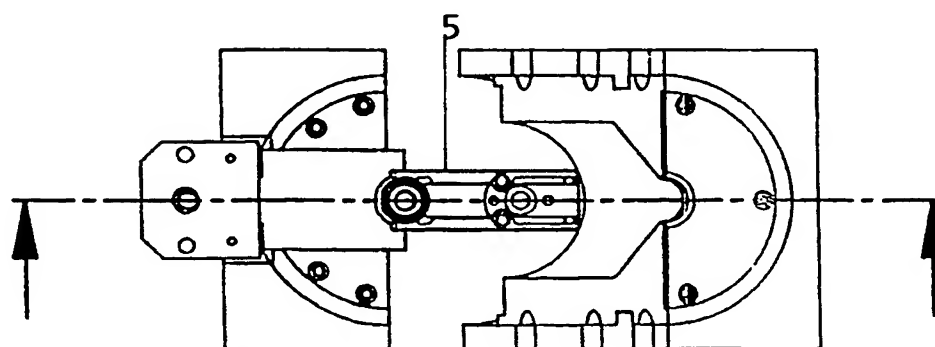


FIG. 3 a

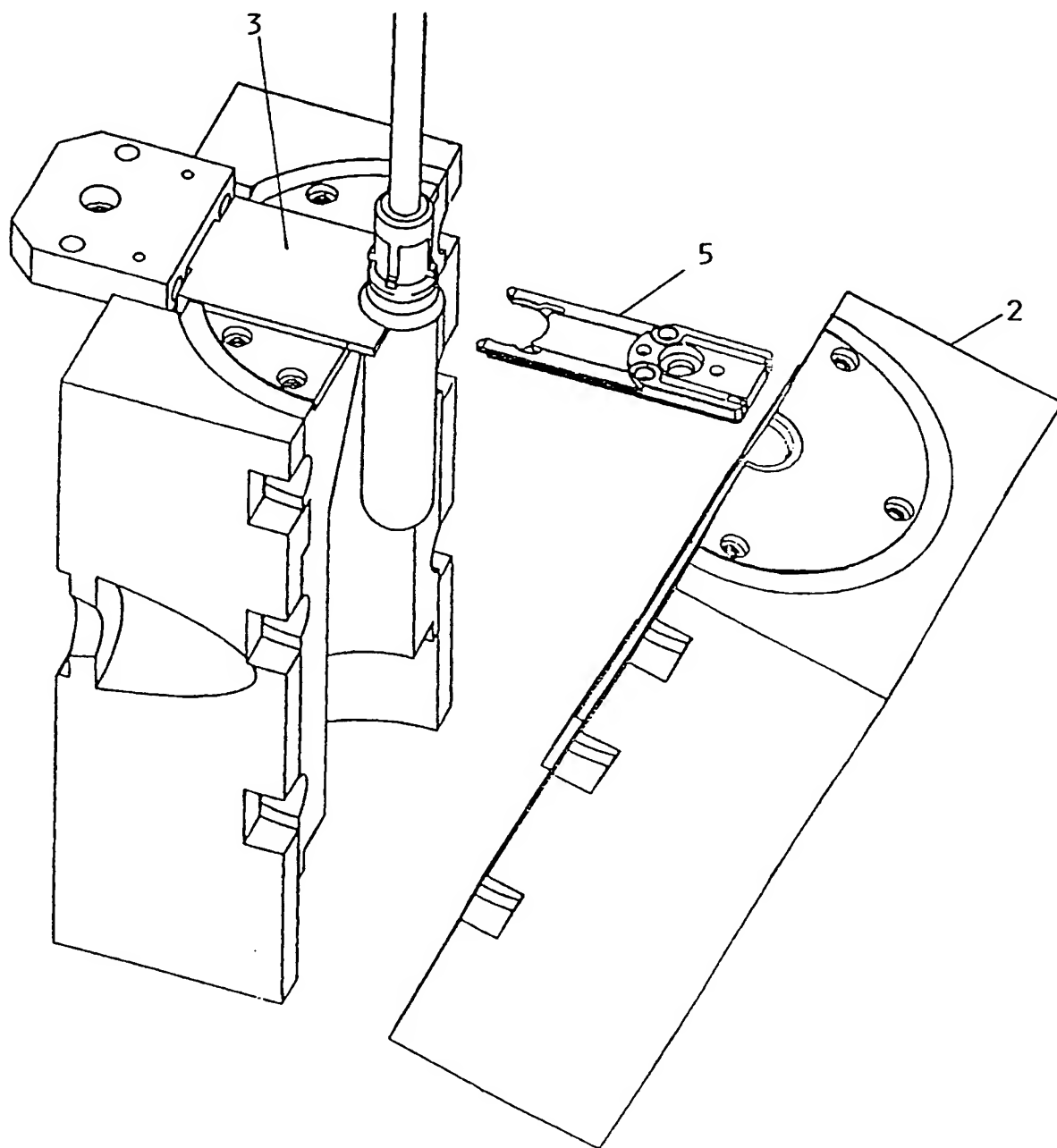


FIG. 4

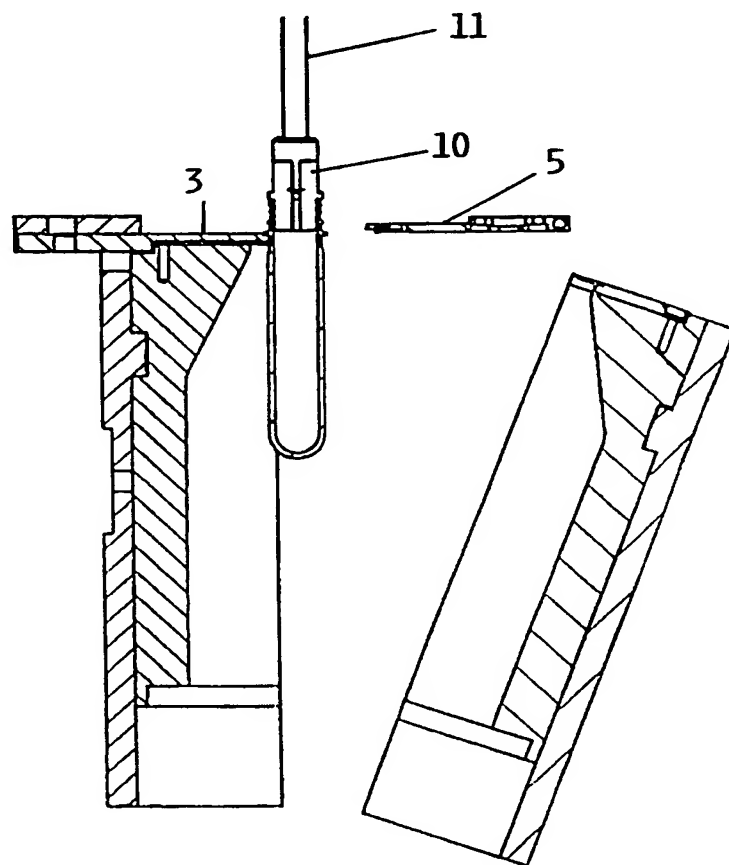


FIG. 4b

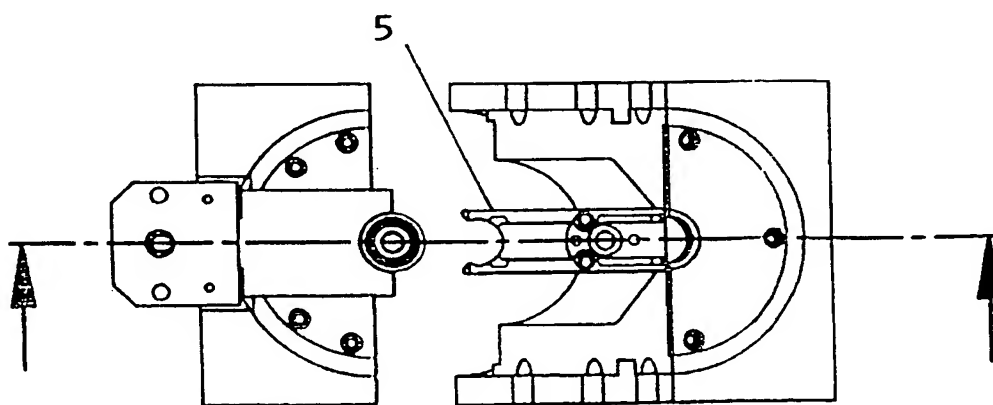


FIG. 4a

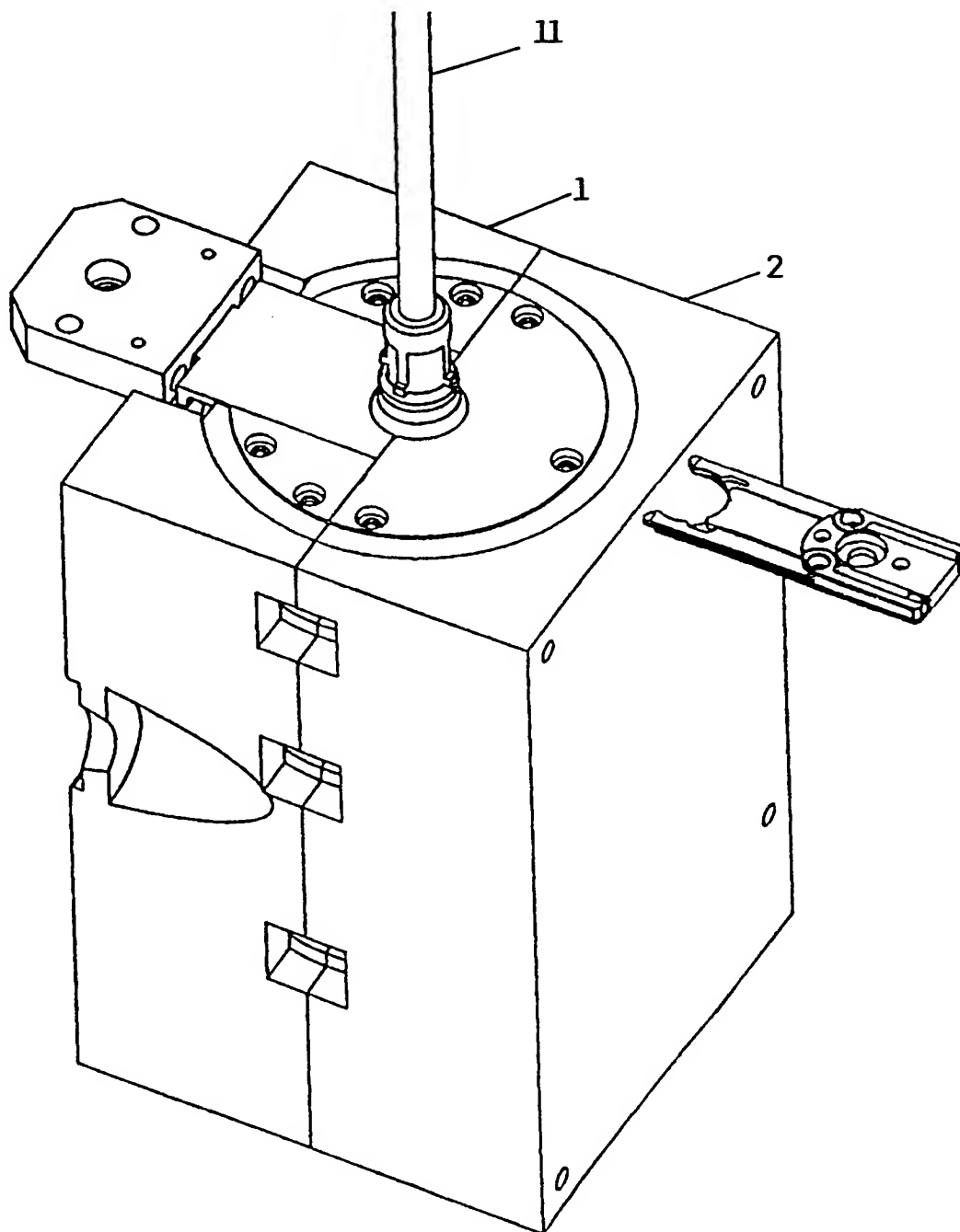


FIG. 5

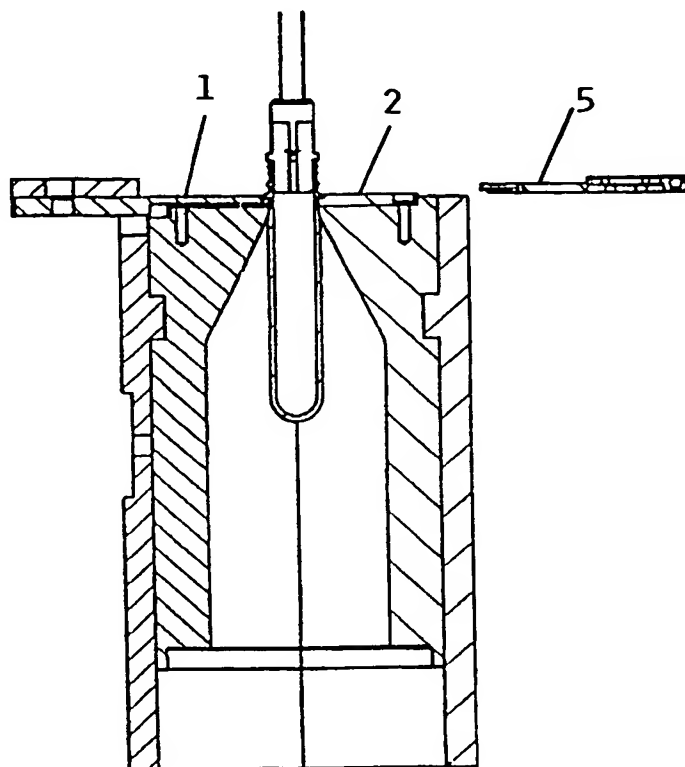


FIG. 5b

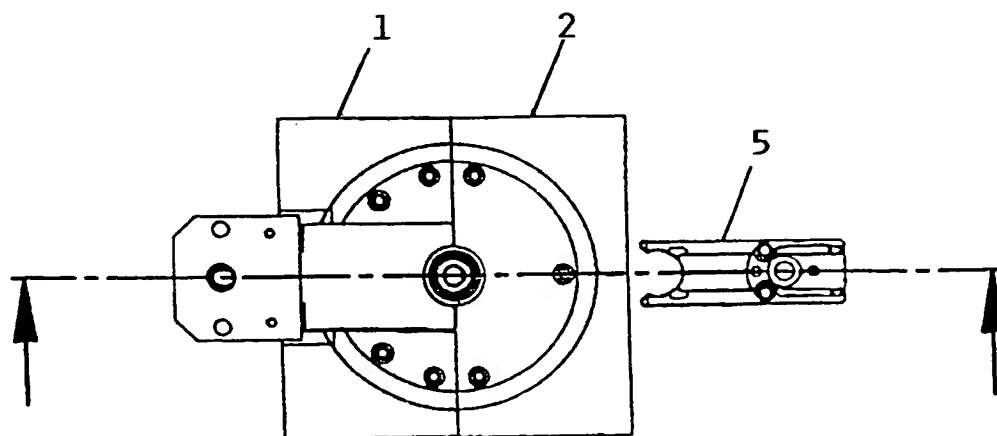


FIG. 5a

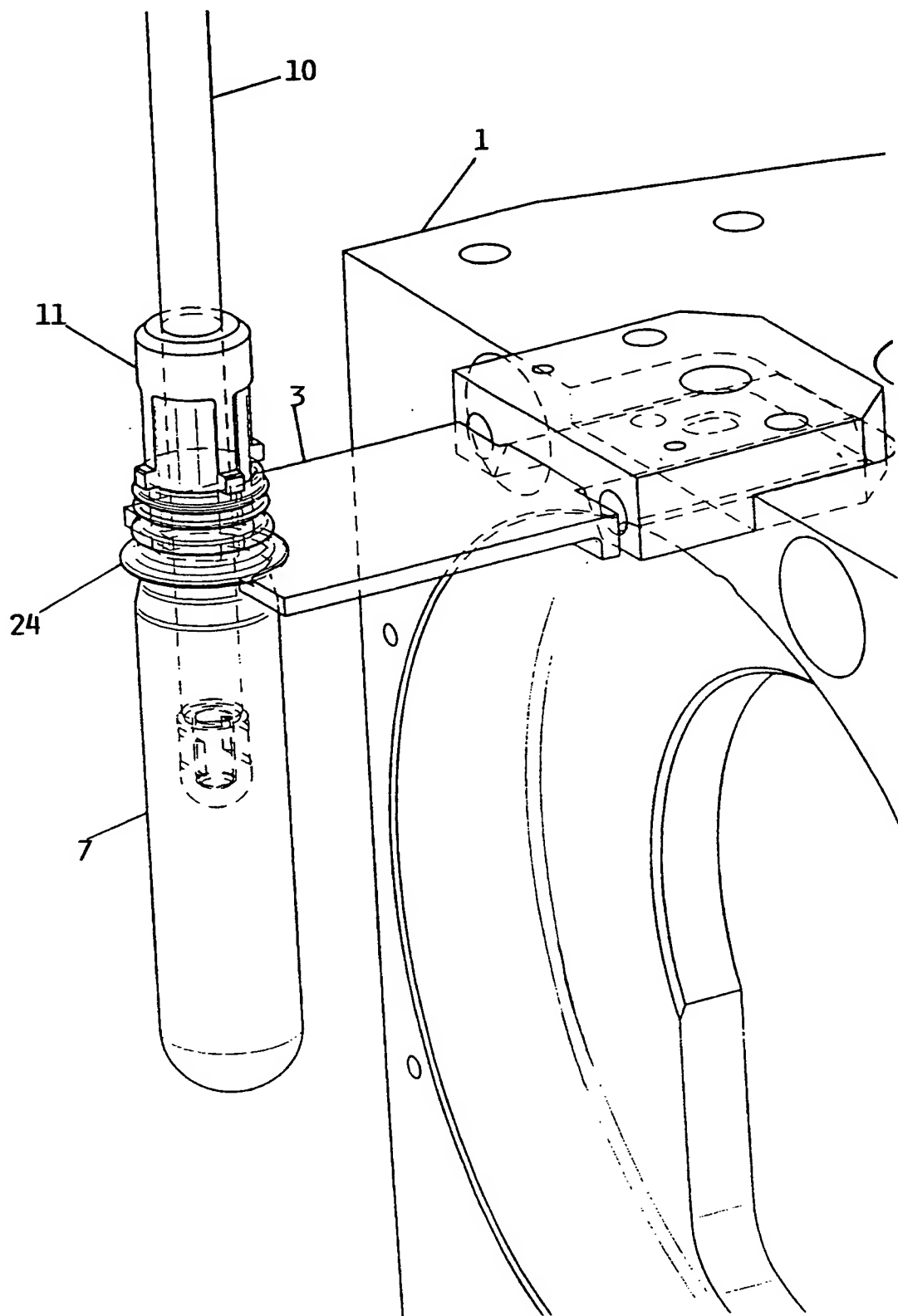


FIG. 6

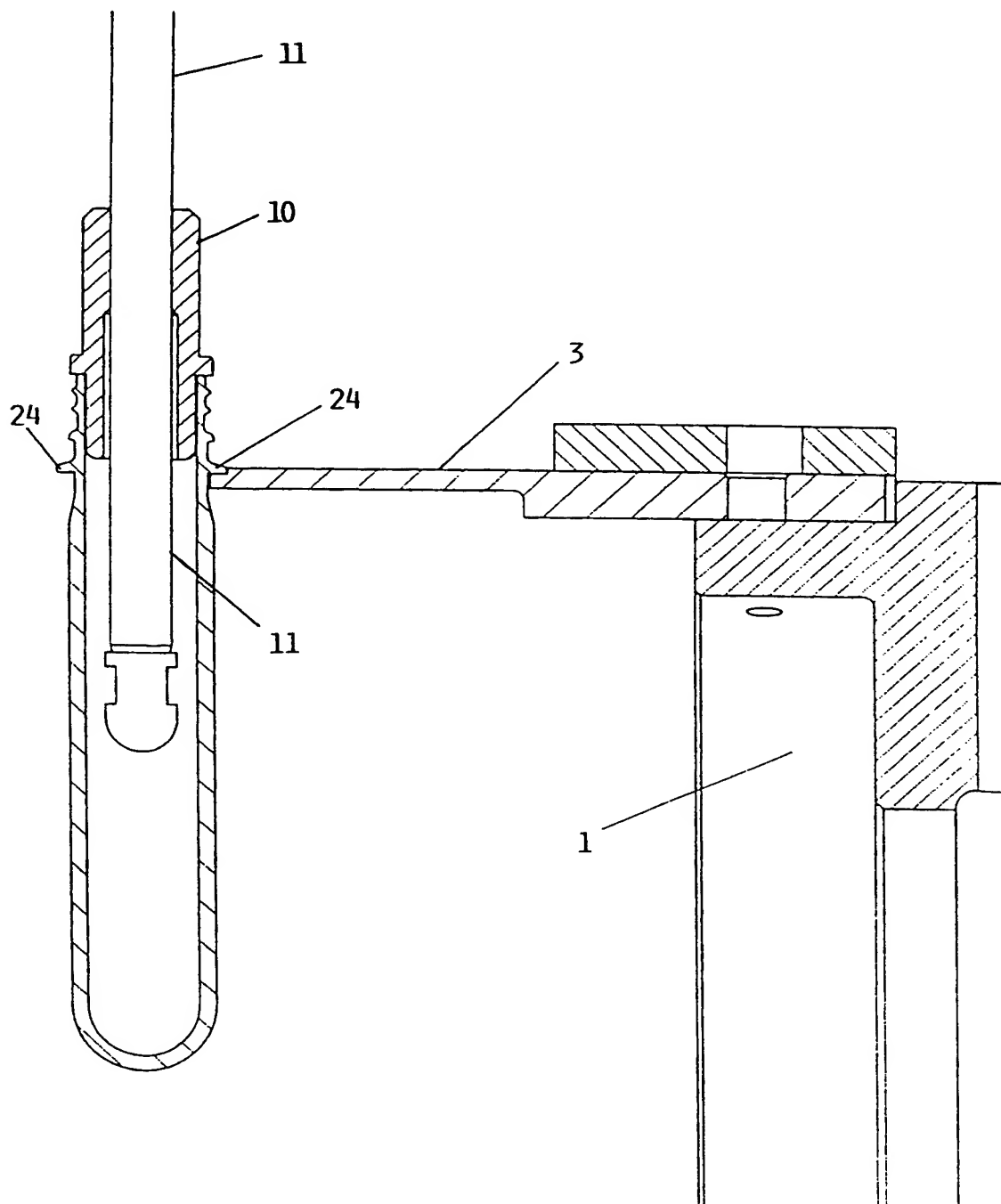


FIG. 7

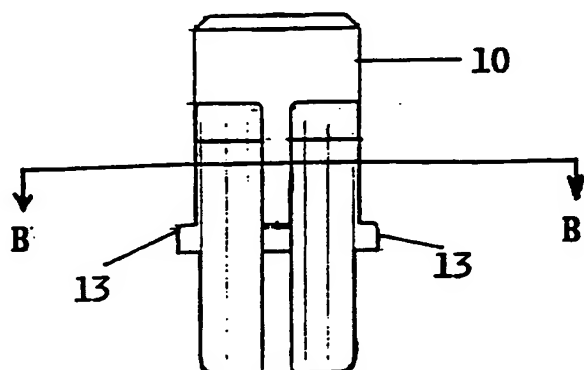


FIG. 10

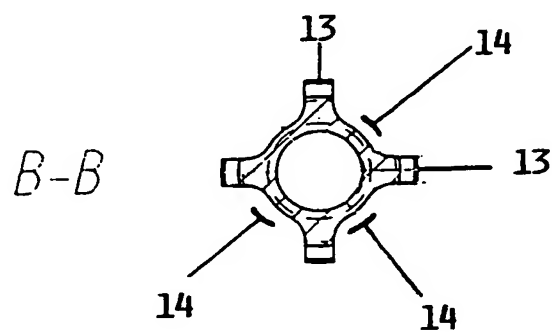


FIG. 9

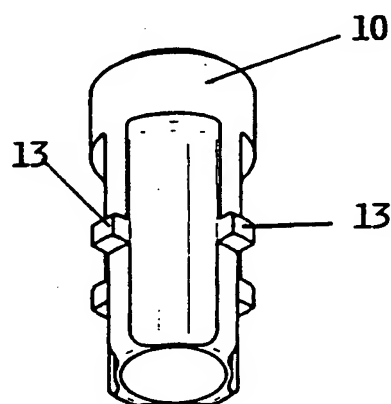


FIG. 8

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 00/05332

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B29C49/36 B29C49/42

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B29C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 035 463 A (ROSENKRANZ OTTO ET AL) 12 July 1977 (1977-07-12)	1,6,10
A	figures 1,3,4,8	11,13,14
P,X	WO 99 62692 A (ZOPPAS MATTEO ;SIPA SPA (IT)) 9 December 1999 (1999-12-09) cited in the application figures 1,2,4	1,6-9
A	FR 1 430 899 A (TURBOPLAST) 25 May 1966 (1966-05-25) figures 6,7	1,610
A	WO 94 15770 A (ADS ;SETTEMBRINI ANTOINE DI (FR)) 21 July 1994 (1994-07-21) figures	1,6,10

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *Z* document member of the same patent family

Date of the actual completion of the international search

28 September 2000

Date of mailing of the international search report

06/10/2000

Name and mailing address of the ISA
European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Kosicki, T

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 00/05332

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4035463 A	12-07-1977	DE 1704119 A DK 127098 B FR 1559785 A GB 1233104 A US 3599280 A	03-02-1972 24-09-1973 14-03-1969 26-05-1971 17-08-1971
WO 9962692 A	09-12-1999	IT PN980042 A AU 4144599 A	03-12-1999 20-12-1999
FR 1430899 A	25-05-1966	BE 669509 A DE 1479705 A NL 6511707 A,B US 3415915 A	10-03-1966 10-07-1969 11-03-1966 10-12-1968
WO 9415770 A	21-07-1994	FR 2700293 A AT 155732 T AU 670178 B AU 5835894 A BR 9403462 A CA 2117461 A CN 1101782 A,B CZ 9402047 A DE 69404400 D DE 69404400 T DK 640035 T EP 0640035 A ES 2105625 T GR 3025083 T JP 8500066 T NZ 259533 A PL 305071 A RU 2125936 C US 5509796 A	13-07-1994 15-08-1997 04-07-1996 15-08-1994 01-06-1999 21-07-1994 19-04-1995 15-12-1994 28-08-1997 13-11-1997 06-10-1997 01-03-1995 16-10-1997 30-01-1998 09-01-1996 27-08-1996 09-01-1995 10-02-1999 23-04-1996

PATENT COOPERATION TREATY

WO 01/07235
PCT/EP00/05332

PCT

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:

GIUGNI, Valter
Propria S.r.l.
Via Mazzini, 13
I-33170 Pordenone
ITALIE

Date of mailing (day/month/year) 01 February 2001 (01.02.01)		
Applicant's or agent's file reference SIPA/99/193		IMPORTANT NOTICE
International application No. PCT/EP00/05332	International filing date (day/month/year) 09 June 2000 (09.06.00)	Priority date (day/month/year) 23 July 1999 (23.07.99)
Applicant SIPA S.P.A. et al		

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
- US**

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:
- BR,CA,CN,EP,JP,MX**

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on 01 February 2001 (01.02.01) under No. WO 01/07235

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

<p style="text-align: center;">The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland</p> <p>Facsimile No. (41-22) 740.14.35</p>	<p>Authorized officer</p> <p style="text-align: center;">J. Zahra</p> <p>Telephone No. (41-22) 338.83.38</p>
---	--

REC'D 23 OCT 2001

WIPO PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference SIPA/99/193		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/EP00/05332	International filing date (day/month/year) 09/06/2000	Priority date (day/month/year) 23/07/1999
International Patent Classification (IPC) or national classification and IPC B29C49/36		
Applicant SIPA S.P.A. et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.


2. This REPORT consists of a total of 4 sheets, including this cover sheet.

- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 7 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 11/01/2001	Date of completion of this report 19.10.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Dorfschmidt, E Telephone No. +49 89 2399 2915



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/EP00/05332

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-3,5-10	as originally filed			
4,4a	as received on	08/09/2001	with letter of	05/09/2001

Claims, No.:

1-13	as received on	08/09/2001	with letter of	05/09/2001
------	----------------	------------	----------------	------------

Drawings, sheets:

1/13-13/13	as originally filed
------------	---------------------

Drawings, No.:

6A	as received on	08/09/2001	with letter of	05/09/2001
----	----------------	------------	----------------	------------

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/EP00/05332

- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-13
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-13
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-13
	No:	Claims	

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP00/05332

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Nearest prior art with respect to the subject-matter of claim 1 is US-A-4035463 (D1). This document discloses an apparatus for blow molding hollow plastic containers according to the preamble of claim 1. Thus, claim 1 is delimited correctly with respect to D1.
2. The specific constructional details with respect to the fork member, the pincer-like gripper and the small-tube assembly according to the characterising portion could not be derived from the prior art, as the claimed features do not exist there.

Therefore, the subject-matter of claim 1 seems to fulfil the requirements of Article 33 PCT with respect to novelty and inventive step.

3. Dependent claims 2 to 13 are concerned with further details of the invention and seem likewise to be novel and inventive.

Re Item VII

Certain defects in the international application

The technical features mentioned in the claims are not followed in the preamble by reference characters relating to these features, contrary to Rule 6.2(b) of the PCT.

Additional remark:

Newly filed Figure 6A replaces originally filed Figur 6 and, therefore, should be read as Figure 6.

respective pre-defined position,

- a pincer-like gripper (5) adapted to transfer a respective preform (7) from an external position and automatically fit it into said receptacle (8) of the respective fork member (3), as well as to automatically disengage from said preform upon the latter having been firmly fitted into said respective receptacle,

- a small-tube assembly (4) adapted to move into inserting in the mouth portion (6) of said preform when the latter is so restrained in said respective receptacle (8).

3. Apparatus according to claim 2, characterized in that the locked condition of said preform is determined:

- either by it engaging said pincer-like gripper (5),
- or by the combined action of said fork member (3) and the respective small-tube assembly (4).

4. Apparatus according to claim 3, characterized in that said small-tube assembly comprises:

- a substantially cylindrical insert piece (10) adapted to firmly fit into the mouth portion of the respective preform,
- a stretching rod (11), which is provided slidably inside of said insert piece and is adapted to be displaced in a rectilinear manner into the respective preform when said respective insert piece is so firmly fitted into the mouth portion of said respective preform.

5. Apparatus according to claim 4, characterized in that said insert piece (10) is provided along its periphery with a plurality of passages or recesses (14) adapted to enable gas to flow from the outside to the inside of the respective preform when said insert piece is fully and firmly fitted and locked into the respective preform.

6. Apparatus according to any of the preceding claims, characterized in that said central structure (20), to which said pairs of half-moulds are associated, is a rotary structure on a horizontal plane, and said pairs of half-moulds are arranged, preferably regularly spaced from each other, along a circular periphery centered on the axis of rotation of said rotary structure.

*Replaced
by 10/20/00*

7. Apparatus according to claim 6, characterized in that said pairs of half-moulds are comprised of a respective stationary half-mould (1) and a respective moving half-mould (2) capable of opening from and closing against the respective stationary half-mould.

8. Apparatus according to claim 7, characterized in that said stationary half-moulds are substantially joined to said appropriate central structure (20) and are arranged in a substantially vertical position, and the respective moving half-moulds (2) are adapted to move into clamping with a substantially rotary movement about respective horizontal axes of rotation.

9. Apparatus according to claim 8, characterized in that said horizontal axes are orthogonal to the axis of rotation of said rotary central structure.

10. Method for inserting and locking a preform in a pre-determined position of a pair of blow-moulding half-moulds, characterized in that it comprises following five phases, in which:

a) - said preform is approached to said pre-determined position by means of a respective gripper (5) adapted to engage said preform, said gripper being capable to be transferred in a controllable manner into an appropriate disposition with respect to a pre-defined one (1) of said half-moulds:

b) - said preform is locked in place with respect to an appropriate receptacle member (8) that is firmly joined to said pre-defined one (1) of said half-moulds;

c) - an appropriate small-tube assembly, which is comprised of an insert piece (10) and a respective stretching rod (11), is inserted in the mouth portion (6) of said preform;

d) - said gripper (5) automatically disengages from the respective preform;

e) - said pair of half-moulds moves into closing and clamping.

11. Method according to claim 10, characterized in that the above cited phases d) and e) are adapted to be performed at least partially at the same time.

12. Method according to claim 10 or 11, characterized in that the above cited phases c) and e) are adapted to be performed at least partially at the same time.

13. Method according to any of the claims 10 to 13, characterized in that said rotary central structure is adapted to support a plurality of pairs of said half-moulds according to claims 1 to 9, and that said five phases a) to e) are performed in an automatic, continuous and orderly sequence for said plurality of pairs of said half-moulds.

10 14. Method according to claim 13, characterized in that the rotation period of said rotary central structure coincides with the cycle time corresponding to the steps during which

- the preform is loaded in the mould,
- the mould is closed and clamped,
- 15 - the preform is blow moulded through the various steps connected with the process,
- the mould is opened by the separation of the respective half-moulds,
- the blow-moulded product is removed therefrom.

- the need for the neck of the preform to be locked in place, ie. clamped with a mould (the half-moulds) makes it necessary for the same preform to be released from its transferring means only upon the half-moulds being completely clamped together; this of course requires that the related operations be carried out in series, ie. in a sequence, under resulting greater usage of time, which of course contributes to an increased overall cycle time and, therefore, a marked reduction in the performance capabilities and the general productivity of the entire apparatus;

- furthermore, upon the final container having been blow-moulded, the opening of the mould quite frequently gives rise to a slight displacement of the respective container and this makes much more difficult for an appropriately provided pick-up and unloading member to engage the neck portion of the container and then transfer the same container into the next station.

Based on the above considerations, it is therefore a main purpose of the present invention to provide the blow moulding apparatus for the production of hollow bodies, as well as the operating mode thereof, in such a manner as to enable its productivity to be increased by the effect of an accelerated movement of the blowing half-moulds.

20

A further purpose of the present invention is to make it possible for the blow-moulded container to be firmly and reliably held in position when the respective half-moulds are opened.

25 The apparatus and the method according to the present invention shall furthermore be capable of being implemented with the use of currently available techniques and, therefore, shall be reasonably low-cost, reliable and preferably capable of being integrated with a preform production stage situated upstream.

30 These aims, along with other features of the present invention, are reached in a blow moulding apparatus that is made and operates as recited in the appended claims, and may be implemented in some parts, or arrangements thereof, a preferred embodiment of which is described below in detail and illustrated with

5

CLAIMS

10

1. Apparatus for blow moulding hollow plastic containers, comprising:

- a plurality of pairs of openable and closable half-moulds capable of being coupled to each other and clamped together, said pairs being associated to an appropriate central structure (20),

15

- devices to handle, transfer and introduce the preforms in said corresponding half-moulds as these are kept in their open position,

- a pick-up device adapted to remove the blow-moulded container from the pair of half-moulds upon them being opened, ie. separated,

20 - a mould opening and closing mechanism adapted to close, ie. clamp said half-moulds together upon them having passed through the position in which preform insertion is carried out, and to open, ie. separate said half-moulds from each other in correspondence of the mechanism provided to remove the finished container therefrom,

characterized in that

25

- there are provided means adapted to arrange a respective preform in a pre-defined position suitable for blow moulding, and to hold it in this position regardless of the position and mutual relation of said respective pair of half-moulds, in particular when said half-moulds are at least partially open, ie. separated from each other.

30

2. Apparatus according to claim 1, characterized in that said means comprise:

- a fork member (3) joined to a respective stationary half-mould (1) and provided with a receptacle (8) adapted to place the respective preform into said

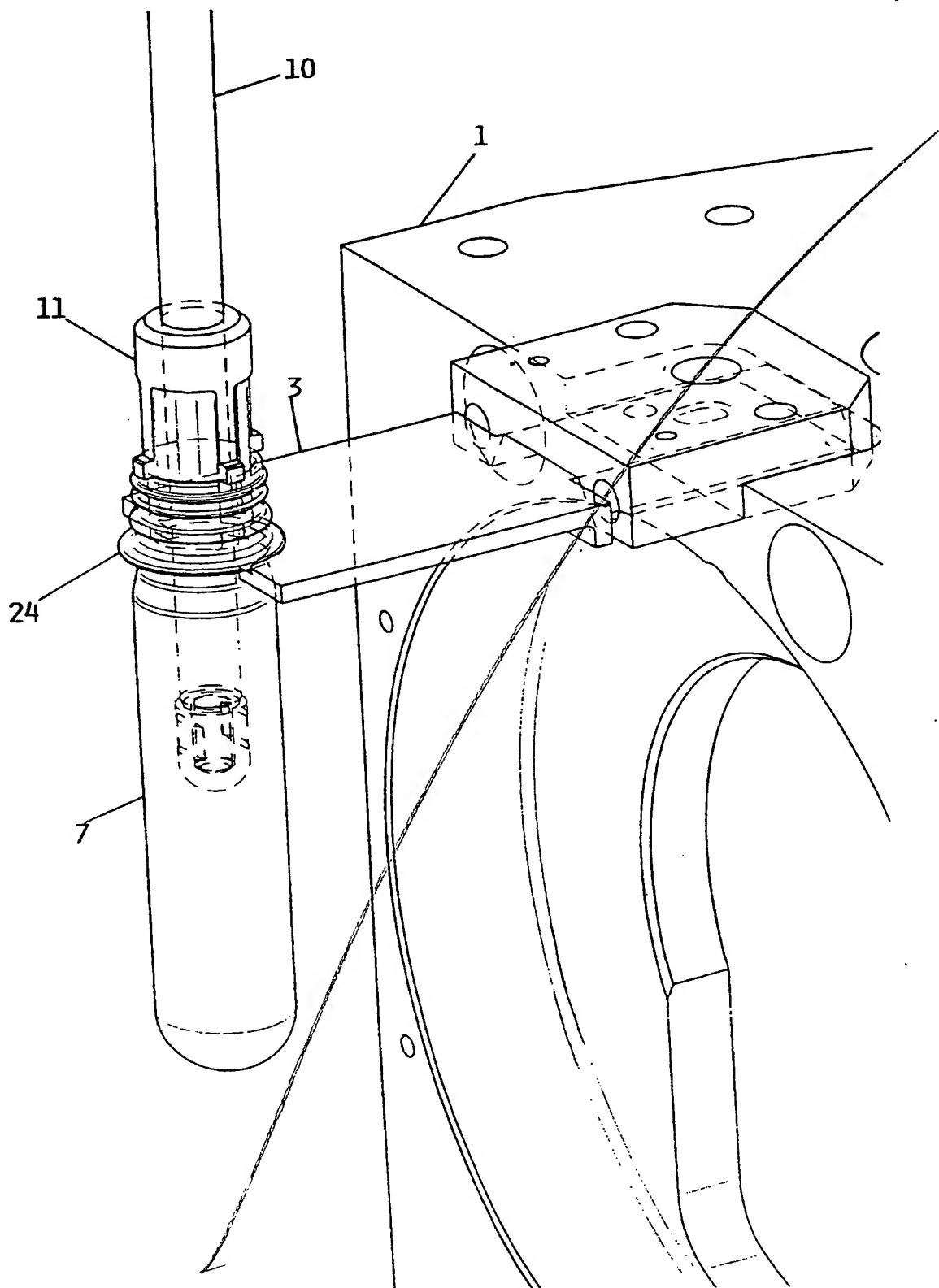


FIG. 6

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

To:

GIUGNI, Valter; BUSCA, Luciano
PROPRIA S.R.L.
Via Mazzini, 13
I-33170 Pordenone
ITALIE

Date of mailing
(day/month/year)

19.10.2001

Applicant's or agent's file reference
SIPA/99/193

IMPORTANT NOTIFICATION

International application No.
PCT/EP00/05332

International filing date (day/month/year)
09/06/2000

Priority date (day/month/year)
23/07/1999

Applicant
SIPA S.P.A. et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/

 European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized officer

Vatel, M


Tel. +49 89 2399-8225



PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference SIPA/99/193		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/EP00/05332	International filing date (day/month/year) 09/06/2000	Priority date (day/month/year) 23/07/1999	
International Patent Classification (IPC) or national classification and IPC B29C49/36			
Applicant SIPA S.P.A. et al.			
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 4 sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of 7 sheets.</p>			
<p>3. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input checked="" type="checkbox"/> Certain defects in the international application VIII <input type="checkbox"/> Certain observations on the international application 			
Date of submission of the demand 11/01/2001		Date of completion of this report 19.10.2001	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized officer Dorfschmidt, E Telephone No. +49 89 2399 2915	



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/EP00/05332

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-3,5-10	as originally filed			
4,4a	as received on	08/09/2001	with letter of	05/09/2001

Claims, No.:

1-13	as received on	08/09/2001	with letter of	05/09/2001
------	----------------	------------	----------------	------------

Drawings, sheets:

1/13-13/13	as originally filed			
------------	---------------------	--	--	--

Drawings, No.:

6A	as received on	08/09/2001	with letter of	05/09/2001
----	----------------	------------	----------------	------------

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/EP00/05332

- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-13
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-13
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-13
	No:	Claims	

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP00/05332

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Nearest prior art with respect to the subject-matter of claim 1 is US-A-4035463 (D1). This document discloses an apparatus for blow molding hollow plastic containers according to the preamble of claim 1. Thus, claim 1 is delimited correctly with respect to D1.
2. The specific constructional details with respect to the fork member, the pincer-like gripper and the small-tube assembly according to the characterising portion could not be derived from the prior art, as the claimed features do not exist there.

Therefore, the subject-matter of claim 1 seems to fulfil the requirements of Article 33 PCT with respect to novelty and inventive step.

3. Dependent claims 2 to 13 are concerned with further details of the invention and seem likewise to be novel and inventive.

Re Item VII

Certain defects in the international application

The technical features mentioned in the claims are not followed in the preamble by reference characters relating to these features, contrary to Rule 6.2(b) of the PCT.

Additional remark:

Newly filed Figure 6A replaces originally filed Figur 6 and, therefore, should be read as Figure 6.

WO 01/07235

PCT/EP00/05332

- the need for the neck of the preform to be locked in place, ie. clamped with a mould (the half-moulds) makes it necessary for the same preform to be released from its transferring means only upon the half-moulds being completely clamped together; this of course requires that the related operations be carried out in series, 5 ie. in a sequence, under resulting greater usage of time, which of course contributes to an increased overall cycle time and, therefore, a marked reduction in the performance capabilities and the general productivity of the entire apparatus;

- furthermore, upon the final container having been blow-moulded, the opening 10 of the mould quite frequently gives rise to a slight displacement of the respective container and this makes much more difficult for an appropriately provided pick-up and unloading member to engage the neck portion of the container and then transfer the same container into the next station.

From US 4.035,463 it is known a method and an apparatus for blowing plastic preforms in a rotary table (EIII) with blow molds. Each of said blow molds consists of two symmetrical halves (62), supported by a common vertical spindle, so that said halves are misplaced in the horizontal plane. Furthermore, the preforms are previously heated and positioned in a concurring rotary table (EII) and the transfer from said heating table (EII) and the blowing rotary table (EIII) is carried out by a rotary station (D) where rotation axis is vertical, as the vertical spindle (55). However, if a blowing machine is used, having blowing halves, one of which is fixed and oriented outwards, the other being rotatable on an horizontal spindle (instead of a vertical spindle), the technical arrangement and solution described in the cited US patent can not be used due to the interference between said station (D) rotating horizontally and the halves blow mold rotating vertically.

15 Based on the above considerations, it is therefore a main purpose of the present invention to provide the blow moulding apparatus for the production of hollow bodies, as well as the operating mode thereof, in such a manner as to enable its productivity to be increased by the effect of an accelerated movement of the blowing half-moulds.

20

A further purpose of the present invention is to make it possible for the blow-moulded container to be firmly and reliably held in position when the respective half-moulds are opened.

25

The apparatus and the method according to the present invention shall furthermore be capable of being implemented with the use of currently available techniques and, therefore, shall be reasonably low-cost, reliable and preferably capable of being integrated with a preform production stage situated upstream.

30

These aims, along with other features of the present invention, are reached in a blow moulding apparatus that is made and operates as recited in the appended claims, and may be implemented in some parts, or arrangements thereof, a preferred embodiment of which is described below in detail and illustrated with

WO 01/07235

PCT/EP00/05332

5

CLAIMS

10

1. Apparatus for blow moulding hollow plastic containers, comprising:

- a plurality of pairs of openable and closable half-moulds capable of being coupled to each other and clamped together, said pairs being associated to an appropriate central structure ~~(20)~~.

15

- devices to handle, transfer and introduce the preforms in said corresponding half-moulds as these are kept in their open position.

- a pick-up device adapted to remove the blow-moulded container from the pair of half-moulds upon them being opened, ie. separated,

20

- a mould opening and closing mechanism adapted to close, ie. clamp said half-moulds together upon them having passed through the position in which preform insertion is carried out, and to open, ie. separate said half-moulds from each other in correspondence of the mechanism provided to remove the finished container therefrom.

~~characterized in that~~

25

~~there are provided~~ means adapted to arrange a respective preform in a pre-defined position suitable for blow moulding, and to hold it in this position regardless of the position and mutual relation of said respective pair of half-moulds, in particular when said half-moulds are at least partially open, ie. separated from each other.

30

~~2. Apparatus according to claim 1, characterized in that said means comprise:~~

- a fork member (3) joined to a respective stationary half-mould (1) and provided with a receptacle (8) adapted to place the respective preform into said

WO 01/07235

PCT/EP00/05332

respective pre-defined position,

- a pincer-like gripper (5) adapted to transfer a respective preform (7) from an external position and automatically fit it into said receptacle (8) of the respective fork member (3), as well as to automatically disengage from said preform upon the latter having been firmly fitted into said respective receptacle.

- a small-tube assembly (4) adapted to move into inserting in the mouth portion (6) of said preform when the latter is so restrained in said respective receptacle (8).

- 2/
3. Apparatus according to claim 1, characterized in that the locked condition of said preform is determined:

- either by it engaging said pincer-like gripper (5),
- or by the combined action of said fork member (3) and the respective small-tube assembly (4).

- 3/
4. Apparatus according to claim 2, characterized in that said small-tube assembly comprises:

- a substantially cylindrical insert piece (10) adapted to firmly fit into the mouth portion of the respective preform,

- a stretching rod (11), which is provided slidably inside of said insert piece and is adapted to be displaced in a rectilinear manner into the respective preform when said respective insert piece is so firmly fitted into the mouth portion of said respective preform.

- 4/
5. Apparatus according to claim 3, characterized in that said insert piece (10) is provided along its periphery with a plurality of passages or recesses (14) adapted to enable gas to flow from the outside to the inside of the respective preform when said insert piece is fully and firmly fitted and locked into the respective preform.

- 5/
6. Apparatus according to any of the preceding claims, characterized in that said central structure (20), to which said pairs of half-moulds are associated, is a rotary structure on a horizontal plane, and said pairs of half-moulds are arranged, preferably regularly spaced from each other, along a circular periphery centered on the axis of rotation of said rotary structure.

WO 01/07235

PCT/EP00/05332

6/ 7. Apparatus according to claim ⁵ 6, characterized in that said pairs of half-moulds are comprised of a respective stationary half-mould (1) and a respective moving half-mould (2) capable of opening from and closing against the respective stationary half-mould.

7/ 8. Apparatus according to claim ⁶ 7, characterized in that said stationary half-moulds are substantially joined to said appropriate central structure (20) and are arranged in a substantially vertical position, and the respective moving half-moulds (2) are adapted to move into clamping with a substantially rotary movement about respective horizontal axes of rotation.

8/ 9. Apparatus according to claim ⁷ 8, characterized in that said horizontal axes are orthogonal to the axis of rotation of said rotary central structure.

15 9/ 10. Method for inserting and locking a preform in a pre-determined position of a pair of blow-moulding half-moulds, characterized in that it comprises following five phases, in which:

a) - said preform is approached to said pre-determined position by means of a gripper (5) adapted to engage said preform, said gripper being capable to be transferred in a controllable manner into an appropriate disposition with respect to a pre-defined one (1) of said half-moulds:

b) - said preform is locked in place with respect to an appropriate receptacle member (8) that is firmly joined to said pre-defined one (1) of said half-moulds;

25 c) - an appropriate small-tube assembly, which is comprised of an insert piece (10) and a respective stretching rod (11), is inserted in the mouth portion (6) of said preform;

d) - said gripper (5) automatically disengages from the respective preform;

e) - said pair of half-moulds moves into closing and clamping.

30 10/ 11. Method according to claim ⁹ 10, characterized in that the above cited phases d) and e) are adapted to be performed at least partially at the same time.

WO 01/07235

PCT/EP00/05332

^{9 10}
~~M~~ ¹² ~~12~~. Method according to claim ~~10~~ or ~~11~~, characterized in that the above cited phases c) and e) are adapted to be performed at least partially at the same time.

¹² ~~13~~. Method according to any of the claims ^{9 11} ~~10~~ to ~~13~~, characterized in that said
5 rotary central structure is adapted to support a plurality of pairs of said half-moulds according to claims 1 to 9, and that said five phases a) to e) are performed in an automatic, continuous and orderly sequence for said plurality of pairs of said half-moulds.

¹³ ~~14~~. Method according to claim ¹² ~~13~~, characterized in that the rotation period of
10 said rotary central structure coincides with the cycle time corresponding to the steps during which

- the preform is loaded in the mould,
- the mould is closed and clamped,
- 15 - the preform is blow moulded through the various steps connected with the process,
- the mould is opened by the separation of the respective half-moulds,
- the blow-moulded product is removed therefrom.

WO 01/07235

PCT/EP00/05332

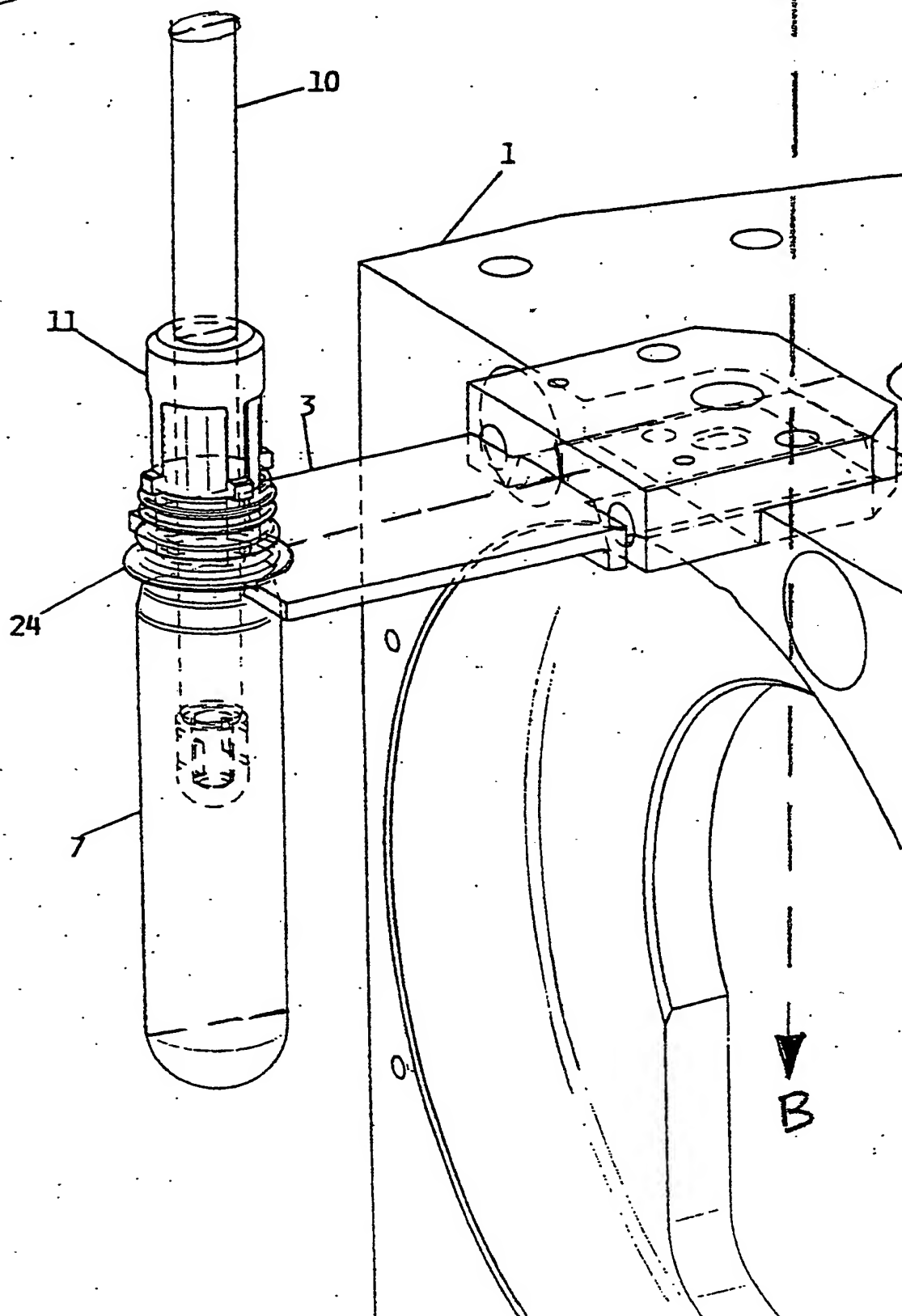


FIG. 6 A

AMENDED SHEET

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference SIPA/99/193	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/EP 00/ 05332	International filing date (day/month/year) 09/06/2000	(Earliest) Priority Date (day/month/year) 23/07/1999
Applicant SIPA S.P.A.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 03 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (see Box II).

4. With regard to the title,

☐ the text is approved as submitted by the applicant.

☒ the text has been established by this Authority to read as follows:

ENTERING INJECTION MOULDED PREFORMS IN A MOULD OF A HIGH-EFFICIENCY BLOW-MOULDING APPARATUS

5. With regard to the abstract,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

2☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/EP 00/05332

Box III TEXT OF THE ABSTRACT (Continuation of Item 5 of the first sheet)

The deficiencies under Rule 8.1(d) are rectified as follows:

ln.2 :...half-moulds (1,2)...
ln.3 :...pairs (1,2)...
ln.4 :...half-mould (1)...
ln.5 :...half-mould (2)...
ln.6 :...adapted (3,4)...
ln.7 :...preform (7)...
ln.8 :...preform (7)...
ln.9 :...half-moulds (1,2)...fork means (3)...
ln.10 :...half-mould (1)...gripper (5)...
ln.11 :...preform (7)...
ln.12 :...means (3)...small-tube (4)...
ln.13 :...preform (7)...means (3)...

REPLACE in line 9 "...mens..." with "...means..."

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 00/05332

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B29C49/36 B29C49/42

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B29C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 035 463 A (ROSENKRANZ OTTO ET AL) 12 July 1977 (1977-07-12)	1,6,10
A	figures 1,3,4,8	11,13,14
P,X	WO 99 62692 A (ZOPPAS MATTEO ;SIPA SPA (IT)) 9 December 1999 (1999-12-09) cited in the application figures 1,2,4	1,6-9
A	FR 1 430 899 A (TURBOPLAST) 25 May 1966 (1966-05-25) figures 6,7	1,610
A	WO 94 15770 A (ADS ;SETTEMBRINI ANTOINE DI (FR)) 21 July 1994 (1994-07-21) figures	1,6,10

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

G document member of the same patent family

Date of the actual completion of the international search

28 September 2000

Date of mailing of the international search report

06/10/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Kosicki, T

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 00/05332

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4035463	A	12-07-1977	DE 1704119 A	03-02-1972
			DK 127098 B	24-09-1973
			FR 1559785 A	14-03-1969
			GB 1233104 A	26-05-1971
			US 3599280 A	17-08-1971
WO 9962692	A	09-12-1999	IT PN980042 A	03-12-1999
			AU 4144599 A	20-12-1999
FR 1430899	A	25-05-1966	BE 669509 A	10-03-1966
			DE 1479705 A	10-07-1969
			NL 6511707 A,B	11-03-1966
			US 3415915 A	10-12-1968
WO 9415770	A	21-07-1994	FR 2700293 A	13-07-1994
			AT 155732 T	15-08-1997
			AU 670178 B	04-07-1996
			AU 5835894 A	15-08-1994
			BR 9403462 A	01-06-1999
			CA 2117461 A	21-07-1994
			CN 1101782 A,B	19-04-1995
			CZ 9402047 A	15-12-1994
			DE 69404400 D	28-08-1997
			DE 69404400 T	13-11-1997
			DK 640035 T	06-10-1997
			EP 0640035 A	01-03-1995
			ES 2105625 T	16-10-1997
			GR 3025083 T	30-01-1998
			JP 8500066 T	09-01-1996
			NZ 259533 A	27-08-1996
			PL 305071 A	09-01-1995
			RU 2125936 C	10-02-1999
			US 5509796 A	23-04-1996

INTERNATIONAL SEARCH REPORT

National Application No.

PCT/EP 00/05332

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B29C49/36 B29C49/42

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B29C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 035 463 A (ROSENKRANZ OTTO ET AL) 12 July 1977 (1977-07-12)	1,6,10
A	figures 1,3,4,8	11,13,14
P,X	WO 99 62692 A (ZOPPAS MATTEO ;SIPA SPA (IT)) 9 December 1999 (1999-12-09) cited in the application figures 1,2,4	1,6-9
A	FR 1 430 899 A (TURBOPLAST) 25 May 1966 (1966-05-25) figures 6,7	1,610
A	WO 94 15770 A (ADS ;SETTEMBRINI ANTOINE DI (FR)) 21 July 1994 (1994-07-21) figures	1,6,10

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *&* document member of the same patent family

Date of the actual completion of the international search

28 September 2000

Date of mailing of the international search report

06/10/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Kosicki, T

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Commissioner
 US Department of Commerce
 United States Patent and Trademark
 Office, PCT
 2011 South Clark Place Room
 CP2/5C24
 Arlington, VA 22202
 ETATS-UNIS D'AMERIQUE
 in its capacity as elected Office

Date of mailing (day/month/year) 08 March 2001 (08.03.01)	
International application No. PCT/EP00/05332	Applicant's or agent's file reference SIPA/99/193
International filing date (day/month/year) 09 June 2000 (09.06.00)	Priority date (day/month/year) 23 July 1999 (23.07.99)
Applicant ZOPPAS, Matteo	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
 11 January 2001 (11.01.01)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
 34, chemin des Colombettes
 1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

C. Cupello

Telephone No.: (41-22) 338.83.38